

**WHAT IS CLAIMED IS:**

1. A non-naturally occurring recombinant DNA molecule comprising a sequence encoding a chelon protein which binds mercuric ions.
2. The non-naturally occurring recombinant DNA molecule of claim 1 wherein the sequence encodes a chelon protein having the amino acid sequence given in SEQ ID NO:4.
3. The non-naturally occurring recombinant DNA molecule of claim 1 wherein the sequence encodes a chelon protein which binds cadmium as well as mercuric ion.
4. The non-naturally occurring recombinant DNA molecule of claim 3 having an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9; SEQ ID NO:10; SEQ ID NO:11; and SEQ ID NO:12.
5. A host cell transformed or transfected to contain the recombinant DNA molecule of claim 1.
6. A host cell transformed or transfected to contain the recombinant DNA molecule of claim 3.
7. The transformed or transfected host cell of claim 6, wherein the chelon protein which is encoded has the amino sequence given in SEQ ID NO:4.
8. The transformed or transfected host cell of claim 6, wherein the chelon protein which is encoded has the amino sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9; SEQ ID NO:10; SEQ ID NO:11; and SEQ ID NO:12.
9. A method for recombinantly producing a chelon protein in a host cell, said method comprising the steps of:

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- a) infecting or transforming a host cell capable of expressing a chelon coding sequence with a vector comprising a promoter active in said host cell operably linked to a coding region for said chelon having an amino acid sequence as selected from the group consisting of SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9; SEQ ID NO:10; SEQ ID NO:11; and SEQ ID NO:12 to produce a recombinant host cell; and
  - b) culturing the recombinant host cell under conditions wherein said chelon is expressed.
10. A method for removing divalent mercury or cadmium cations from a source comprising divalent mercury or cadmium cations, said methods comprising the step of contacting the source with a MerR or chelon protein, whereby the MerR or chelon protein binds the divalent mercury or cadmium cations.
11. The method of claim 10 wherein the chelon protein has an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9; SEQ ID NO:10; SEQ ID NO:11; and SEQ ID NO:12.
12. The method of claim 10 wherein the MerR or chelon protein is bound to a solid substrate and the source is an aqueous material.
13. The method of claim 10 wherein the MerR or chelon protein is expressed in a transgenic plant cell, transgenic plant tissue or transgenic plant.
14. The method of claim 13 wherein the chelon has an amino acid sequence selected from the group consisting of SEQ ID NO:4, SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9; SEQ ID NO:10; SEQ ID NO:11; and SEQ ID NO:12.